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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/083,533      | 02/27/2002  | Hiroshi Hashimoto    | 020244              | 6400             |

23850 7590 02/06/2003

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EXAMINER

LE, THAO X

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
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2814

DATE MAILED: 02/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/083,533

Applicant(s)

HASHIMOTO ET AL.

Examiner

Thao X Le

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 21 January 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) 16-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Election/Restrictions*

1. Applicant's election without traverse of Group I, Claims 1-15 on 01/21/03 in Paper No. 4 is acknowledged.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 9-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Recited 'the first active region covered with a tunnel insulating film', 'second active region', 'a control gate formed of an embedded diffusion region', and capacitive-coupled via the insulating film' in claim 9 are unclear and undefined in the specification. Claims 10-15 are reject at least for depending on rejected claim 9. Applicants are requested to point out such structure in the drawings.

For the purpose of examination, the following assumptions are made:

- a. The first active region is the floating gate area
- b. The second active region is the control area
- c. The capacitive-coupled via the insulating film is the combination of control gate, the insulting film, and floating gate.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art (APA) in view of US 6294430 to Fastow et al.

Regarding to claims 1, 4, APA discloses a semiconductor integrated circuit (IC) device fig. 1-8B, specification pages 1-14, comprising: a substrate 11, fig. 1a, page 2 line 18, a nonvolatile memory device (flash memory cell), fig 1O, formed in a memory cell region A, fig. 1a, of substrate 11 and having a multilayer gate electrode, 16A-B and 16F, page 5 line 33, structure comprising a tunnel insulating film 12A, page 2 line 31, and having sidewall surfaces covered with a protection insulating film 18, fig. 1J, formed of an oxide, page 5 line 14; and a semiconductor device (logic circuit device), fig. 1A, formed in a device region B of substrate 11, the semiconductor device comprising a gate insulating film 12B, fig. 1F, page 3 line 37, covering

Art Unit: 2814

substrate 11 and gate electrode 16B, fig. 1J, page 5 line 7, formed on the gate insulating film 12B, and wherein the gate insulating film 12B is interposed between substrate 11 and the gate electrode 16B have a substantially uniform thickness.

But, APA does not disclose the IC device comprises a bird's beak structure is formed of oxide film at an interface of the tunnel insulating film 121A and the floating gate electrode 13A, wherein the bird's beak structure penetrating into the floating gate electrode 13A along the interface from the sidewall faces of the floating gate electrode 13A, and wherein the thermal oxide film forming the protection insulating film connects to the bird's beak structure.

However, Fastow reference discloses the IC device in fig. 2B, comprised a tunnel oxide 204, multiplayer gate structure (208, 210, 212), a protecting insulating film 214, having a bird's beak (such lifting area caused by oxide formation underneath is also known as bird's beak, column 1 line 13) structure 216, column 5 line 32, is formed of oxide film at an interface of the tunnel insulating film 204 and the floating gate electrode 216, wherein the bird's beak structure penetrating into the floating gate electrode 216 along the interface from the sidewall faces of the floating gate electrode 216, and thermal oxide film 214 forming the protection insulating film connects to the bird's beak structure. It would have been obvious the bird's beak structure as claimed would formed when the protecting insulating film is formed and Fastow confirms the formation of bird's beak structure as above. Furthermore, when the claimed and the prior art products are identical or substantially identical in structure, a *prima facie* case of either

Art Unit: 2814

anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

The process limitations "the thermal" in claim 1, does not carry weight in a claim drawn to structure. *In re Thorpe*, 277 USPQ 964 (Fed. Cir. 1985).

Regarding to claims 2-3, 5, 11-12, APA discloses the IC device wherein the multiplayer gate electrode structure 16 further comprises an insulating film 14, fig. 1G, page 4 line 20, on the floating gate electrode 13A and a control gate electrode 16A (this gate is also known as the control in the flash memory device), fig. 1H, page 4 line 26, formed on the insulated film 14, and herein each of the gate electrode and control gate electrode comprises a polycide, page 4 line 30, and oxide film 18, and wherein the protection insulating film 18 continuously covers sidewall faces and a top surface of the multilayer gate electrode structure, fig. 1J

Regarding to claims 6, 13, APA does not disclose the IC device is formed on a SOI substrate. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to use SOI as a substrate, because such silicon substrate or SOI substrate would have been considered a mere substitution of art-recognized equivalent values, see US 6436765, column 2 line 57.

Regarding to claims 7-8, 14-15, APA discloses the tunnel oxide 12A or nitride 12B, page 5.

Regarding to claim 9-10, APA discloses the IC device in the specification page 1-14, comprising: a substrate 11, a nonvolatile memory device (flash cell) formed in a memory cell region A, page 2 line 15, of substrate 11, the nonvolatile memory device comprising: a first active region 13A having a tunnel insulating film 12A, a second active region 16A formed next

Art Unit: 2814

to the first active region 13A and covered with an insulating film 14, fig. 1J, a control gate 16A formed an embedded diffusion region formed in the second active region, a first gate electrode 13A extending on the tunnel insulating film 12A in the first active region and forming a bridge between the first and second active regions to be capacitive-coupled via the insulating film 14 to the embedded diffusions region in the active region, the first gate electrode 13A having the sidewall faces thereof covered with a protective insulting oxide film 18, and a diffusion region 11, fig. 1P, formed on a each of sides of the first gate electrode in the first active region, and a semiconductor device (logic circuit device) formed in a device region B, page 2 line 16, the semiconductor device comprising a gate insulating film 12B covering substrate and a second gate electrode 16B, fig. 1P, formed on the gate insulating film 12B, and the gate insulating film is interposed between substrate and second gate electrode to have a substantially uniform thickness.

But, APA does not disclose the IC device comprises a bird's beak structure is formed of oxide film at an interface of the tunnel insulating film 121A and the floating gate electrode 13A, wherein the bird's beak structure penetrating into the floating gate electrode 13A along the interface from the sidewall faces of the floating gate electrode 13A, and wherein the thermal oxide film forming the protection insulating film connects to the bird's beak structure.

However, Fastow reference discloses the IC device in fig. 2B, comprised a tunnel oxide 204, multiplayer gate structure (208, 210, 212), a protecting insulating film 214, having a bird's beak (such lifting area caused by oxide formation underneath is also known as bird's beak, column 1 line 13) structure 216, column 5 line 32, is formed of

Art Unit: 2814

oxide film at an interface of the tunnel insulating film 204 and the floating gate electrode 216, wherein the bird's beak structure penetrating into the floating gate electrode 216 along the interface from the sidewall faces of the floating gate electrode 216, and thermal oxide film 214 forming the protection insulating film connects to the bird's beak structure. It would have been obvious the bird's beak structure as claimed would formed when the protecting insulating film is formed and Fastow confirms the formation of bird's beak structure as above. Furthermore, when the claimed and the prior art products are identical or substantially identical in structure, a *prima facie* case of either anticipation or obviousness has been established. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

### ***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X Le whose telephone number is 703-306-0208. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Application/Control Number: 10/083,533

Page 8

Art Unit: 2814

Thao X. Le  
January 30, 2003

A handwritten signature in black ink, appearing to read 'Ngan Van Ngo', with a checkmark to its right.

**Ngan Van Ngo**  
**Primary Examiner**